

### **Complete Listing of the Claims**

This is a complete listing of claims and supersedes all other listings:

1. (currently amended) In a computer system, having one or more processors or virtual machines, one or more memory units, one or more input devices and one or more output devices, optionally a network, and optionally shared memory supporting communication among the processors, a computer implemented method for automatically finding the best matches between buyers' requests and sellers' offerings in a market of products or services, wherein such products or services are described by a plurality of arbitrary attributes, and for representing those matches in computer memory, and for communicating those matches, and for executing commitments based on those matches, said method comprising a microprocessor or virtual machine:
  - (a) creating a buyers abstract representation of a plurality of intrinsic or extrinsic attributes of a request, and the relationship between at least one utility of the request and at least one state of the plurality of attributes;
  - (b) creating a sellers abstract representation of a plurality of intrinsic or extrinsic attributes of an offer, and the relationship between the total price of the offering and at least one state of the plurality of attributes;
  - (c) computing a rating for overall buyer's satisfaction of the plurality of attributes of a request with respect to a given offer;
  - (d) determining the quantity and identity of assignments of sellers' offerings to buyers' requests, within the constraints of each party's stated extrinsic attributes, that produces the best set of matches for a given market; **and**
  - (e) capturing market data from market transactions and using the market data to automatically predict costs of attribute states in hypothetical transanctions by steps comprising:

- (i) recording the request and offer data, along with the transaction price and quantity, for the committed transactions, and for other transactions that scored sufficiently well, and for requests and offers that were not matched in the market;
  - (ii) inferring market value relationships from other data sources, such as sellers' advertisements, and or buyers' requests for proposals;
  - (iii) using of mathematical function approximation techniques for constructing market value functions that describe the relationship between price and the states of various intrinsic or extrinsic attributes in a hypothetical market;
- (f) automatically joining buyers' requests in a consortium by steps comprising:
- (i) forming the best partition of the buyers' requests into groups or singletons of requests whose representation of attributes can be satisfied by the same seller offering;
  - (ii) forming the combined abstract representation of the requests for the consortium, said representation which will satisfy each buyer in the consortium;
  - (iii) constructing an artificial negotiating entity that will represent at least one consortium, and can conceal the identities of the buyers in the consortium; and

{(e)} (g) optionally signaling that the quantities and identities of assignments are accepted and that the transaction is committed by buyers and sellers.

2. (canceled)
3. (canceled)
4. (currently amended) [A] The method of claim [2] [1] wherein sellers' offerings are automatically joined in a consortium, by steps comprising a microprocessor or virtual machine:

- (a) forming the best partition of the sellers' offerings into groups or singletons of offerings which considered together achieve the highest values on hypothetical market transactions, with regard to the value functions constructed in claim 2;
- (b) forming the abstract representation of the offerings for the consortium, said representation which will represent each offer in the consortium; and
- (c) constructing an artificial negotiating entity that will represent at least one consortium, and can conceal the identities of the sellers in the consortium.

5. (currently amended) [A] The method of claim 2] [1] wherein the plurality of attributes includes both intrinsic qualities of the object of the request or offer, and extrinsic qualities of the transaction or market protocols, wherein the extrinsic attributes comprise commitment protocols and time qualifications.

6. (currently amended) [A] The method of claim 5 wherein the method further comprises a microprocessor or machine:

- (a) combining abstract representations from at least two market participants, to combine maximize the combined satisfaction for the consortium of those participants [,] [,] and
- (b) using buyers' consortiums rather than individual buyers and sellers' consortiums, or individual sellers, in determining the best set of matches,

whereby a transaction can be accomplished between consortia, rather than individual buyers and sellers.

7. (currently amended) [A] The method of claim 6 further comprising a microprocessor or virtual machine joining buyers' requests automatically in a consortium by:

- (a) forming the best partition of the buyers' requests into groups or singletons of requests whose representation of attributes can be satisfied by the same seller offering;

(b) forming the combined abstract representation of the requests for the consortium, said representation which will satisfy each buyer in the consortium; and

(c) constructing an artificial negotiating entity that will represent at least one consortium, and can conceal the identities of the buyers in the consortium;

and automatically joining sellers' offerings in a consortium by:

(d) forming the best partition of the sellers' offerings into groups or singletons of offerings which considered together achieve the highest values on hypothetical market transactions, with regard to the value functions constructed in claim 2;

(e) forming the abstract representation of the offerings for the consortium, said representation which will represent each offer in the consortium; and

(f) constructing an artificial negotiating entity that will represent at least one consortium, and can conceal the identities of the sellers in the consortium,

and using the market value data from transactions to construct mathematical function approximations predicting the value of states of attributes for hypothetical transactions to construct a stream or compendium of market information.

8. (currently amended) [A] The method of claim 7 further comprising a microprocessor or virtual machine numerically representing the determination of best assignments and quantities as an optimization problem and optimizing the assignments and quantities by finding the total of each buyer's and each seller's satisfaction with the transactions to be committed.

9. (currently amended) [A] The method of claim 8 further comprises a microprocessor or virtual machine matching the plurality of attributes of a request and the plurality of attributes of an offer by inferring the match of the attribute qualities of a request which are logically implied by attribute qualities of an offer.

10. (currently amended) [A] The method of claim 9 further comprising a microprocessor or virtual machine determining the quantity and identity of assignments of sellers' offerings to buyers' requests which produce the best set of feasible matches for a given market.

11. (currently amended) [A] The method of claim 10, wherein the mathematical function approximation technique used to relate market value to attribute states is at least one technique selected from the group consisting of:

- (a) linear regression[,] [:]
- (b) non-linear regression[,] [:]
- (c) machine learning techniques[,] [:]
- (d) neural nets[,] [:]
- (e) polynomial approximations[,] [:] and
- (f) Chebyshev approximation.

12. (currently amended) The method of claim 10 wherein the optimization problem is solved by at least one technique selected from the group consisting of:

- (a) heuristic search[,] [:]
- (b) numeric optimization[,] [:]
- (c) genetic algorithms[,] [:]
- (d) mixed integer programming[,] [:]
- (e) simulated annealing[,] [:]
- (f) dynamic programming[,] [:]
- (g) MonteCarlo and quasi-MonteCarlo[,] [:]

- (h) interval methods[,] [:]
- (i) Lagrangian relaxation methods[,] [:]
- (j) meta-genetic algorithms[,] [:]
- (k) differential genetic programming[,] [:]
- (l) sequential linear approximation[,] [:]
- (m) sequential quadratic approximation[,] [:]
- (n) constraint propagation methods[,] [:]
- (o) gradient methods[,] [:]
- (p) enumeration[,] [:]
- (q) parallel execution of optimization techniques[,] [:] and
- (r) interleaved execution of techniques.

13. (currently amended) [A] The method of claim 10 further comprising a microprocessor or virtual machine using a total market excess value as the measure of highest total market value.

14. (currently amended) [A] The method of claim 10 further comprising a microprocessor or virtual machine using a multiagent system to distribute the processing across many processors and memory devices to achieve timely calculations of best assignments and quantities.

15. (currently amended) [A] The method of claim 10 wherein a measure of the utility at the least one state of the plurality of attributes is used to compute a rating for the overall satisfaction of a request with respect to a given offering by using at least one technique selected from the group consisting of:

- (a) weighted fuzzy-logic conjunction operators[,] [:]

- (b) weighted geometric means[,] [:]
- (c) a weighted version of Yager's T-NORM[,] [:]
- (d) weighted arithmetic means[,] [:] and
- (e) a weighted combination, with the weights derived via analytic hierarchy analysis.

16. (currently amended) [A] The method of claim 10 wherein the request and offer data, the transaction price and quantity, the committed transactions, other transactions that scored sufficiently well, and the requests and offers that were not matched in the market are made available to market participants.

17. (currently amended) [A] The method of claim 10 wherein different instances of at least one module of the entire system is specialized for each different market.

18. (currently amended) [A] The method of claim 10 wherein an ontology is used for inferring the match of the at least one state of a plurality of attributes of a request which is logically implied by the at least one state of a plurality of attributes of an offer.

19. (currently amended) [A] The method of claim 10 wherein explicit transfer of funds is not required.

20. (currently amended) [A] The method of claim 10 wherein advertisement of the availability of commitment protocols and time qualifications supported by the system leads to the market evolution of the most efficient protocols and time qualifications.

21. (currently amended) [A] The method of claim 10 further comprising a microprocessor or virtual machine advertising the optimality of honest characterization of the utility of each attribute utility causing market participants to communicate an honest assessment of those utilities, thereby improving the market for both buyers and sellers.

22. (currently amended) [A] The method of claim 10 further comprising a microprocessor or virtual machine invoking auction protocols when there is at least two requests per one offer or at least two offers per one request.

23. (currently amended) [A] The method of claim 10 wherein the abstract representation of the relationship of the utility of an attribute of the request, is created using at least one technique selected from the group consisting of:

- (a) linear functions[,] [:]
- (b) piece-wise linear functions[,] [:]
- (c) logistic functions[,] [:]
- (d) cubic splines[,] [:]
- (e) look-up tables[,] [:] and
- (f) other numeric functions that compute utility with respect to a given attribute's states.

24. (currently amended) [A] The method of claim 10 wherein the abstract representation of the relationship between price of the offer and at least two states of an attribute of the offer, is created using at least one technique selected from the group consisting of:

- (a) linear functions[,] [:]
- (b) piece-wise linear functions[,] [:]
- (c) logistic functions[,] [:]
- (d) cubic splines[,] [:]
- (e) look-up tables[,] [:] and
- (f) other numeric functions that compute price with respect to a given attribute's states.

25. (currently amended) [A] The method of claim 10 further comprising a microprocessor or virtual machine communicating the abstract representations of requests and offerings by termsheets and offersheets, respectively.

26. (currently amended) [A] The method of claim 10 further comprising a microprocessor or virtual machine describing the requests as employment positions and describing the offerings as employee attributes and compensation requirements.

27. (currently amended) [A] The method of claim 10 further comprising a microprocessor or virtual machine describing the requests as tasks to be accomplished, and describing the offers as agents, people and or software, willing to accomplish those tasks.

28. (currently amended) A computer data processing system comprising:

at least one processor or virtual machine; at least one memory unit; one or more input devices and one or more output devices, optionally at least one on network; optionally at least one memory shared among one or more processors; for automatically finding the best matches between buyers' requests and sellers' offerings in a market of products or services, wherein such products or services are described by a plurality of arbitrary attributes for representing those matches in computer memory, and for communicating those matches, and for executing commitments based on those matches, comprising:

(a) a module implementing a buyer's abstract representation of a plurality of intrinsic and extrinsic attributes of a request, and the relationship between at least one utility of the request and at least one state of the plurality of attributes;

(b) a module implementing a seller's abstract representation of a plurality of intrinsic or extrinsic attributes of an offer, and the relationship between the total price of the offering and at least one state of the plurality of attributes;

(c) a module implementing a means for computing a rating for overall buyers' satisfaction of a plurality of attributes of a request with respect to a given offer;

(d) a module implementing a means for determining the quantity and identity of assignments of sellers' offerings to buyers' requests, within the constraints of each party's stated extrinsic attributes, that produces the best set of matches for a given market; and

(e) a module implementing a means for capturing market value data from market transactions and using the

data to automatically predict the costs of attribute states in hypothetical transactions,

wherein the system further comprises:

(i) a module implementing a means for recording the request and offer data, along with the transaction price and quantity, for the committed transactions, and for other transactions that scored sufficiently well, and for requests and offers that were not matched in the market;

(ii) a module implementing a means for inferring market value relationships from other data sources, such as sellers' advertisements, and or buyers' requests for proposals;

(iii) a module implementing a means for using mathematical function approximation techniques for constructing market value functions that describe the relationship between price and the states of various attributes in a hypothetical market;

(f) a module implementing a means for automatically joining buyers' requests in a consortium, wherein the

system further comprises:

(i) a module implementing a means for forming the best partition of the buyers' requests into groups or singletons of requests whose representation of attributes can be satisfied by the same seller offering;

(ii) a module implementing a means for forming the combined abstract representation of the requests for the consortium, which will satisfy each buyer in the consortium;

(iii) a module implementing a means for constructing an artificial negotiating entity

that will represent at least one consortium, and can conceal the identities of the buyers in the consortium; and

{(e)} [g] optionally a module implementing a means for signaling that the quantities and identities of assignments are accepted and that the transaction is committed by buyers and sellers.

29. (canceled)

30. (canceled)

31. (currently amended) [A] The computer system of claim [29] 28 wherein sellers' offerings are automatically joined in a consortium, wherein the system further comprises:

(a) a module implementing a means for forming the best partition of the sellers' offerings into groups or singletons of offerings which considered together achieve the highest values on hypothetical market transactions, with regard to the market value functions;

(b) a module implementing a means for forming the abstract representation of the offerings for the consortium, said representation which will represent each offer in the consortium; and

(c) a module implementing a means for constructing an artificial negotiating entity that will represent at least one consortium, and can conceal the identities of the sellers in the consortium.

32. (currently amended) [A] The computer system of claim [29] 28 wherein the plurality of attributes includes both intrinsic qualities of the object of the request or offer, and extrinsic qualities of the transaction or market protocols, and wherein the extrinsic attributes comprise commitment protocols and time qualifications within the at least one processor or virtual machine.

33. (currently amended) [A] The computer system of claim 32 wherein a transaction can be accomplished between consortia, rather than individual buyers and sellers, the system further comprises:

- (a) a module implementing a means for combining abstract representations from at least two market participants, to maximize the satisfaction for the consortium of those participants[,]  
[;] and
- (b) a module implementing a means for regarding buyers' consortiums rather than individual buyers and sellers' consortiums, or individual sellers, in determining the best set of matches.

34. (currently amended) [A] The computer system of claim 33, wherein the market value data is captured from market transactions, and used to construct market value functions to automatically predict the costs of attribute states in hypothetical transactions, and wherein buyers' requests are automatically joined in a consortium, wherein the system further comprises:

- (a) a module implementing a means for forming the best partition of the buyers' requests into groups or singletons of requests whose representation of attributes can be satisfied by the same seller offering;
- (b) a module implementing a means for forming the combined abstract representation of the requests for the consortium, said representation which will satisfy each buyer in the consortium; and
- (c) a module implementing a means for constructing an artificial negotiating entity that will represent at least one consortium, and can conceal the identities of the buyers in the consortium;

and wherein sellers' offerings are automatically joined in a consortium, wherein the system further comprises:

(d) a module implementing a means for forming the best partition of the sellers' offerings into groups or singletons of offerings which considered together achieve the highest values on hypothetical market transactions, with regard to the market value functions;

(e) a module implementing a means for forming the abstract representation of the offerings for the consortium, said representation which will represent each offer in the consortium; and

(f) a module implementing a means for constructing an artificial negotiating entity that will represent at least one consortium, and can conceal the identities of the sellers in the consortium,

and wherein the market value data from transactions is used to construct mathematical function approximations predicting the value of states of attributes for hypothetical transactions is used to construct a stream or compendium of market information within the at least one processor or virtual machine.

35. (currently amended) [A] The computer system of claim 34 wherein the determination of best assignments and quantities is represented numerically as an optimization problem, and the assignments and quantities can be found by optimizing the total of each buyer's and each seller's satisfaction with the transactions to be committed within the at least one processor or virtual machine.

36. (currently amended) [A] The computer system of claim 35 wherein the plurality of attributes of a request is matched to plurality of attributes of an offer by inferring the match of the attribute qualities of a request which are logically implied by attribute qualities of an offer within the at least one processor or virtual machine.

37. (currently amended) [A] The computer system of claim 36 wherein the means of determining the quantity and identity of assignments of sellers' offerings to buyers' requests produces the best set of feasible matches for a given market within the at least one processor or virtual machine.

38. (currently amended) [A] The computer system of claim 37 wherein the mathematical function approximation technique used within the at least one processor or virtual machine to relate market value to attribute states is at least one technique selected from the group consisting of:

- (a) linear regression[,] [:]
- (b) non-linear regression[,] [:]
- (c) machine learning techniques[,] [:]
- (d) neural nets[,] [:]
- (e) polynomial approximations[,] [:] and
- (f) Chebyshev approximation.

39. (currently amended) [A] The computer system of claim 37 wherein the

mathematical function approximation technique used within the at least one processor or virtual machine to relate market value to attribute states is at least one technique selected from the group consisting of:

- (a) heuristic search[,] [:]
- (b) numeric optimization[,] [:]
- (c) genetic algorithms[,] [:]
- (d) mixed integer programming[,] [:]
- (e) simulated annealing[,] [:]
- (f) dynamic programming[,] [:]
- (g) MonteCarlo and quasi-MonteCarlo[,] [:]

- (h) interval methods[,] [:]
- (i) Lagrangian relaxation methods[,] [:]
- (j) meta-genetic algorithms[,] [:]
- (k) differential genetic programming[,] [:]
- (l) sequential linear approximation[,] [:]
- (m) sequential quadratic approximation[,] [:]
- (n) constraint propagation methods[,] [:]
- (o) gradient methods[,] [:]
- (p) enumeration[,] [:]
- (q) parallel execution of optimization techniques[,] [:] and
- (r) interleaved execution of techniques.

12. (Canceled)

40. (currently amended) [A] The computer system of claim 37 wherein a total market excess value is used as the measure of highest total market value within the at least one processor or virtual machine.

41. (currently amended) [A] The computer system of claim 37 wherein a multiagent system is used to distribute the processing across many processors and memory devices to achieve timely calculations of best assignments and quantities within the at least one processor or virtual machine.

42. (currently amended) [A] The computer system of claim 37 wherein a measure of the utility of at least one state of the plurality of attributes is used within the at least one processor or virtual

machine to compute a rating for the overall satisfaction of a request with respect to a given offering by using at least one technique selected from the group consisting of:

- (a) weighted fuzzy-logic conjunction operators[;]
- (b) weighted geometric means[;]
- (c) a weighted version of Yager's T-NORM[;]
- (d) weighted arithmetic means[;] and
- (e) a weighted combination, with the weights derived via analytic hierarchy analysis.

43. (currently amended) [A] The computer system of claim 37 wherein the means used in determining the quantity and identity of assignments of sellers' offerings to buyers' requests within the at least one processor or virtual machine are available to market participants.

44. (currently amended) [A] The computer system of claim 37 wherein different instances of at least one module of the entire system is specialized for each different market within the at least one processor or virtual machine.

45. (currently amended) [A] The computer system of claim 37 wherein an ontology is used to support inference of the match of at least one state of the plurality of attributes of a request which is logically implied by at least one state of the plurality of attributes of an offer within the at least one processor or virtual machine.

46. (currently amended) [A] The computer system of claim 37 wherein explicit transfer of funds is not required within the at least one processor or virtual machine.

47. (currently amended) [A] The computer system of claim 37 wherein advertisement of the availability of commitment protocols and time qualifications supported by the system leads to the market evolution of the most efficient protocols and time qualifications within the at least one processor or virtual machine.

48. (currently amended) [A] The computer system of claim 37 wherein advertisement of the optimality of honest characterization of the utility of each attribute utility within the at least one processor or virtual machine causes market participants to communicate an honest assessment of those utilities, thereby improving the market for both buyers and sellers.

49. (currently amended) [A] The computer system of claim 37 wherein auction protocols are invoked when there are at least two requests per one offer or at least two offers per one request within the at least one processor or virtual machine.

50. (currently amended) [A] The computer system of claim 37 wherein the abstract representation of the relationship of the utility of an attribute of the request is created within the at least one processor or virtual machine using at least one technique selected from the group consisting of:

- (a) linear functions[,] [:]
- (b) piece-wise linear functions[,] [:]
- (c) logistic functions[,] [:]
- (d) cubic splines[,] [:]
- (e) look-up tables[,] [:] and
- (f) other numeric functions that compute utility with respect to a given attribute's states.

51. (currently amended) [A] The computer system of claim 37 wherein the abstract representation of the relationship between price of the offer and at least two states of an attribute of the offer, is created within the at least one processor or virtual machine using at least one technique selected from the group consisting of:

- (a) linear functions[,] [:]
- (b) piece-wise linear functions[,] [:]

(c) logistic functions[,] [:]

(d) cubic splines[,] [:]

(e) look-up tables[,] [:] and

(f) other numeric functions that compute price with respect to a given attribute's states.

52. (currently amended) [A] The computer system of claim 37 wherein the abstract representations of requests and offerings within the at least one processor or virtual machine are communicated by termsheets and offersheets, respectively.

53. (currently amended) [A] The computer system of claim 37 wherein requests describe employment positions and the offerings describe employee attributes and compensation requirements within the at least one processor or virtual machine.

54. (currently amended) [A] The computer system of claim 37 wherein the requests within the at least one processor or virtual machine describe tasks to be accomplished, and the offers within the at least one processor or virtual machine describe agents, people and or software, willing to accomplish those tasks.

55. (currently amended) [A] The computer system of claim 37 wherein the information is communicated through the internet by internet protocol messages within and among the at least one processor or virtual machine.

56. (currently amended) [A] The computer system of claim 37 wherein buyers and sellers access the system via web pages, Java clients, or other executable client programs within the at least one processor or virtual machine.

57. (currently amended) In a computer system, having one or more processors or virtual machines, one or more memory units, one or more input devices and one or more output devices, optionally a network, and optionally shared memory supporting communication among the

processors, a computer implemented method for automatically providing a market for products or services, wherein such products or services are described by a plurality of arbitrary attributes, and for constructing matches between buyers' requests and sellers' offerings, and for representing those matches in computer memory, and for maintaining the market and for executing that market and for executing commitments based on that market, said method comprising a microprocessor or virtual machine:

(a) creating a buyer's specification of a plurality of intrinsic or extrinsic attributes of a request, including at least one attribute that represents at least one market protocol and a representation of the buyer's preference for the market protocol;

(b) creating a seller's specification of a plurality of intrinsic or extrinsic attributes including at least one market protocol and a representation of the seller's preference for the market protocol;

(c) constructing the at least one market where the market protocol specified by the buyer and the market protocol specified by the seller are compatible;

(d) providing at least one executable market protocol to act in accordance with the market protocol and preference specified by the buyer and the market protocol and preference specified by the seller;

(e) executing the market protocol;

(f) capturing market data from market transactions and using the market data to automatically predict costs of attribute states in hypothetical transactions by steps comprising:

\_\_\_\_\_ (i) recording the request and offer data, along with the transaction price and quantity, for the committed transactions, and for other transactions that scored sufficiently well, and for requests and offers that were not matched in the market;

\_\_\_\_\_ (ii) inferring market value relationships from other data sources, such as sellers' advertisements, and or buyers' requests for proposals;

\_\_\_\_\_ (iii) using of mathematical function approximation techniques for

constructing market value functions that describe the relationship between price and the states of various intrinsic or extrinsic attributes in a hypothetical market;

(g) automatically joining buyers' requests in a consortium by steps comprising:

(i) forming the best partition of the buyers' requests into groups or singletons of requests whose representation of attributes can be satisfied by the same seller offering;

(ii) forming the combined abstract representation of the requests for the consortium, said representation which will satisfy each buyer in the consortium;

(iii) constructing an artificial negotiating entity that will represent at least one consortium, and can conceal the identities of the buyers in the consortium;

{(f)} {(h)} optionally executing at least one market transaction; and

{(g)} {(i)} optionally signaling that the quantities and identities of assignments committed by the market transaction.

58. (previously presented) The method of claim 57, further comprising a microprocessor or virtual machine representing a buyer's preference for commitment or review with respect to the specification of at least one market protocol.

59. (previously presented) The method of claim 57, further comprising a microprocessor or virtual machine representing a seller's preference for commitment or review with respect to the specification of at least one market protocol.

60. (previously presented) The method of claim 57, further comprising a microprocessor or virtual machine representing a buyer's or seller's specification of at least one market protocol wherein the specification of the market protocol includes at least one protocol selected from the group consisting of: reviewed market clearing, committed market clearing, reviewed auction, reviewed descending price auction, reviewed ascending price auction, reviewed English auction, reviewed Dutch auction, reviewed Vickrey auction, committed auction, committed descending

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price auction, committed ascending price auction, committed English auction, committed Dutch auction, and committed Vickrey auction.